

## **Biospheric Sciences Highlights for May - June 2003**

### **\*\* Northern Eurasia Earth Science Partnership Initiative Workshop Held in Russia**

At the end of April in Suzdal, Russia a major science workshop was organized and conducted by Don Deering that substantially furthered the development of the Northern Eurasia Earth Science Partnership Initiative (NEESPI). Following on the formal agreement between NASA and the Russian Academy of Sciences last October for a focused collaboration to develop a program of research, 90 scientists met to identify and debate the critical Earth science questions for the region of northern Eurasia. Forty-five participants represented Russian institutions, and the other 45 representatives were from Europe, Japan, Ukraine and the U.S. (32 reps.), including five from NASA. Key leaders of various subgroups from the workshop will be working during the next three months to assimilate the results into a draft science plan, which will be formally reviewed by an independent group of scientists in early September and will lead to a published NEESPI Science Plan around the first of the year. Prior to the workshop, Dr. Deering had related meetings in Kyiv with approximately 40 leaders of government science institutions and universities, including the Centre for Aerospace Research of the Earth, National Space Agency of Ukraine, the Ministry of Defense of the Ukraine, the Environmental and Resources Research Institute of Ukraine, the State Scientific-Production Center "Nature" and several universities. The Minister of Environment and Natural Resources of Ukraine was very interested in the NEESPI and offered support for Ukrainian scientists and potential participation in the project. At the request of Leonid Kadenyuk--the Ukraine's first and only cosmonaut, who currently serves as a Presidential Advisor and Ukrainian Parliament Member--Dr. Deering had a brief meeting with the cosmonaut who flew on board the Space Shuttle Columbia during STS-87 in November and December of 1997.

### **\*\* Revised Landsat-5 Thematic Mapper (TM) Radiometric Calibration**

Effective May 5, 2003 the USGS/EROS Data Center (EDC) has revised the radiometric calibration procedures and parameters for Landsat-5 TM data acquired since 1984. This change will improve the product absolute calibration accuracy, consistency over time and consistency with Landsat-7 ETM+ data. Users will need to use new parameters to convert the calibrated data products to radiance. The new procedure for the reflective bands (1-5,7) is based on a lifetime radiometric calibration curve for the instrument derived from the instruments internal calibrator, cross calibration with the ETM+ and vicarious measurements. The thermal band will continue to be calibrated using the internal calibrator. The revised procedures and parameters were developed by the Landsat TM Calibration Working Group (LTMALWG) with funding from the Landsat Project Science Office at GSFC and the EROS Data Center. The LTMALWG consists of representatives from South Dakota State University (D. Helder), the Landsat Project Science Office at GSFC, Canada Centre for Remote Sensing (P. Teillet), University of Arizona (K.Thome), NASA/JPL (F. Palluconi), Rochester Institute of Technology (J. Schott) and the Image Assessment System and Science and Applications Branch at EROS Data.

**\*\* Steve Ungar moderates session at ASPRS on Imaging Spectroscopy in Hazard Monitoring**

Steve Ungar moderated a highly successful double session on the role of Imaging Spectroscopy in Hazard (natural and otherwise) Monitoring and Response at the ASPRS Meeting in Anchorage, Alaska on May 9. Nine papers, including an overview by Steve, drew largely on the EO-1 Hyperion experience to deal with topics ranging from fire fuel analysis to detecting hot spots and asbestos release at the World Trade Center attack site. The level of audience interest generated a request from the organizing committee for Steve to organize a full day session at next year's ASPRS meeting in Denver.

**\*\* Using Landsat data for National Park vegetation mapping and monitoring**

Over the past three years GSFC has collaborated with the National Park Service (NPS) to develop the tools to effectively map and monitor the vegetation resources of National Parks and their environs using Landsat data. The tools and products have a wide variety of potential uses for resource management decisions at the parks and could potentially be useful to the NPS at the national level. During the first phase of this project, we have demonstrated the usefulness of multi-date Landsat 7 data for vegetation mapping at Delaware Water Gap National Recreation Area (NRA) in PA and NJ, with results recently published in the latest issue of Remote Sensing of Environment (Brown de Colstoun et al. 2003).

The second phase focuses on developing active monitoring tools for the parks using Landsat data. In collaboration with the Woods Hole Research Center, the Mid-atlantic Regional Earth Sciences Applications Center at the University of Maryland, and the Delaware Water Gap NRA and the Upper Delaware Scenic and Recreational River National parks, we are planning to study land cover/use changes around the parks and a larger region including portions of the states of NY, PA, and NJ. The Landsat-derived land cover/use change products will be used to track urban growth in the area and to simulate this growth well into the future. Dr. Eric Brown de Colstoun (Code 923) recently presented the goals of this collaboration and potential tools/products to a group of city, county and state officials at the Upper Delaware Council in Narrowsburg, NY. Attendees included park superintendents, representatives from the Upper Delaware Council, Pike County Conservation District, Delaware River Basin Commission, and Delaware County Planning Department. Based on the response from this group there is an acute interest/need for these tools and products by city and county planners, with clear connections with the NPS, as well as potential uses as educational tools.

**Reference:**

Brown de Colstoun , E.C., M.H. Story, C. Thompson, K. Commisso, T.G. Smith, and J.R. Irons. National Park Vegetation Mapping Using Multi-temporal Landsat 7 Data and a Decision Tree Classifier, Remote Sens. Environ., 85:316-327, 2003.

**\*\* Paper discusses comparison of four AVHRR NDVI Datasets**

The paper "Quantitative comparison of four AVHRR global data sets for land applications" by Molly E. Brown, Jorge E. Pinzon, and Compton J. Tucker (all of Code 923) is summarized in the following abstract:

A quantitative comparison of four NOAA-Advanced Very High Resolution Radiometer normalized difference vegetation index (NDVI) datasets at 8 and 16 km spatial resolution has been conducted. We compared the Pathfinder Land (PAL) dataset, the Global Vegetation Index (GVI) dataset of NOAA, and two datasets from the Global Inventory Modeling and Mapping (GIMMS) group (Code 923) that have different processing and post-processing characteristics to determine how well they are able to attenuate artifacts or non-vegetative signals to study vegetation dynamics. We found good agreement among datasets in the northern latitudes and highly seasonal semi-arid zones, and low correlations are found in the highly vegetated tropics, where satellite drift and inadequate stratospheric aerosol corrections are present. We concluded that the NOAA GVI is of a lower spatial resolution, is less complete than the other three datasets, and has few corrections of the significant artifacts present in the NDVI for most regions. The corrections implemented in the PAL data improve its quality, but significant artifacts are introduced in the 1983-1985 and 1991-1994 periods. The new GIMMS-E data prove to be superior to their predecessor GIMMS-D as they have a satellite drift correction and improved signal-to-noise ratio while retaining the calibration and volcanic aerosol corrections of the previous GIMMS dataset.

**\*\* Paper by Biospheric Sciences Branch scientists determined to be one of the most cited recent papers in field of geoscience**

A paper published in the Journal of Atmospheric Science on March 15, 2003 has recently been listed by the Thomson-ISI Web of Science database to be one of the most cited recent papers in the field of Geoscience. The paper was listed on the Thomson-ISI web site July 1st, 2003 <<http://esi-topics.com/>><http://esi-topics.com> under the heading "New Hot Papers".

The paper provides data for aerosol absorption--an aerosol property driving the influence of atmospheric aerosol on climate, but which is very difficult to measure. The paper summarizes the effort of the AERONET (AErosol RObotic NETwork) on developing a climatology on aerosol absorption. These data are highly demanded by the aerosol community for reducing uncertainty in estimates of global climate change.

A summary of the paper is given below:

The paper uses 8 years of worldwide data from the AERONET ground-based radiometers to characterize the aerosol absorption in several key locations with differing aerosol types. The results indicate significant variability of the aerosol absorption due mainly to different meteorological characteristics and also due to differing meteorological conditions. The results reveal several important differences with previous knowledge and clarify features inherent for absorption of each type of aerosol. For example, it was found that biomass burning smoke can be both strongly absorbing and almost non-absorbing depending on the vegetation type burned and whether the combustion is from flaming or smoldering; urban aerosol absorption is much stronger in places where fuels produce much of the air pollution such as more black carbon (i.e.

diesel fuel) or where pollution filtering technology is not widely applied; desert dust absorbs much less solar radiation than known aerosol models predict (this finding is in agreement with satellite analysis).

Dubovik, O. (Code 923), B. N. Holben (Code 923), T. F. Eck (Code 923), A. Smirnov (Code 923), Y. J. Kaufman (Code 913), M. D. King (Code 900), D. Tanré, and I. Slutsker (Code 923), "Variability of absorption and optical properties of key aerosol types observed in worldwide locations", J. Atmos. Sci., 59, 590-608, 2002.

**\*\* Three papers in press by Biospheric Science Branch scientists document potential causes of endemic patterns of asthma**

Three papers are in press documenting ongoing asthma research in the Biospheric Sciences Branch. A summary of this research follows:

Asthma is a chronic disease that can result in exacerbations leading to urgent care in emergency departments and hospitals. These studies direct the search for potential causes of the endemic patterns of asthma events from the myriad of possible factors (environmental, socioeconomic, etc.). The knowledge gained in these studies can aid in identifying future peak periods of asthma admissions, alerting and educating individual asthmatic patients to periods of increased risk, and mitigating asthma events that lead to hospital admissions.

Predicting Pediatric Asthma Hospital Admissions and ED Visits, D. Kimes (Code 923), R. Nelson (Code 923), E. Levine (Code 923), S. Timmins (Code 923), S. Weiss, M.E. Bollinger, and C. Blaisdell, in the International Journal of Neural Computing & Applications (In Press)

Temporal Dynamics of Emergency Department and Hospital Admissions of Pediatric Asthmatics, Daniel Kimes (Code 923), Elissa Levine (Code 923), Sidey Timmins (Code 923), Sheila R. Weiss, Mary E. Bollinger, and Carol Blaisdell in the journal Environmental Research (In Press)

Relationships between pediatric asthma and socioeconomic/urban variables in Baltimore, Maryland, Daniel Kimes (Code 923), Asad Ullahb, Elissa Levine (Code 923), Ross Nelson (Code 923), Sidey Timmins (Code 923), Sheila Weiss, Mary E. Bollinger, and Carol Blaisdell in the journal Health and Place (In Press)

**\*\* Deering Participates in Meetings with European Commission and EU Scientists Concerning NEESPI**

During the period from 30 May through 8 June 2003 Dr. Don Deering traveled to Europe to meet with key scientists and European Commission representatives regarding the NASA-led Northern Eurasia Earth Science Partnership Initiative or NEESPI. He first participated in the European Commission's Framework Programme 6 (FP6) Integrated Project proposal planning workshop in Berlin, Germany for the "Boreas Machine" project. The Boreas Machine Project leaders have a very strong interest in developing their EC project in close coordination with and as an important component of the overall NEESPI program of research in northern Eurasia. Next, Dr. Deering and Dr. Michel Verstaete of the European Commission's Joint Research Center

in Ispra, Italy met with various Directorates General (DG) in Brussels, Belgium to inform the EC officials of the emerging NEESPI, which is addressing issues at the core of various European Union policies (notably those concerned with environment, climate, space exploitation, forests and sustainability) over a geographical area (Northern Eurasia) which is also of direct relevance to the work of these DGs. The plan was to begin working toward U.S.-EU and other international collaborations which will clarify responsibilities, avoid overlaps and improve the scientific output by promoting the optimal use of resources, supporting the institutional mandates of the participating countries and organizations, and synergistically utilizing the strengths that each can bring into the scientific program. In Vienna, Austria Dr. Deering visited the International Institute for Applied Systems Analysis (IIASA), which is an independent, non-governmental research organization that conducts inter-disciplinary scientific studies on environmental, economic, technological and social issues in the context of human dimensions of global change and which receives a large percentage of its annual funding support from the U.S. IIASA conducts research that is directly relevant to the NEESPI; and they have a strong interest in participating in the NEESPI project.

**\*\* A NASA-sponsored workshop on ecosystem structure and remote sensing was held June 23-25 in Annapolis, MD.**

More than 60 invited researchers participated in a workshop titled, "Multi-Dimensional Forested Ecosystem Structure: Requirements for Remote Sensing Observations." The workshop brought together two research communities to help define NASA requirements for remote observations of multi-dimensional forested ecosystem structure: (1) scientists conducting research on the structure and function of forested ecosystems, and (2) scientists and engineers advancing methods for remote sensing of forested ecosystem structure. The workshop was designed to: clarify the key scientific goals of and requirements for remote measurements of forested ecosystem structure, the most relevant remote sensing technologies and their capabilities, and recommend methods by which NASA can evaluate measurement approaches using a common set of requirements.

The workshop concept was originally developed by Robert Knox (Code 923) and Sassan Saatchi (JPL). In planning the workshop, Dr. Knox led an eight-member organizing committee, that included co-chairs Kathleen Bergen (U. Michigan) and Diane Wickland (NASA HQ). NASA's Terrestrial Ecology Program was the workshop sponsor. Scientific goals, requirements, remote sensing approaches, and priorities were outlined in a series of eleven plenary talks and further developed in nine breakout sessions. Ten Goddard researchers were active participants, included providing one of the plenary talks (Knox), chairs for two breakout sessions and one plenary session (Knox), and rapporteurs for two breakout sessions (Jon Ranson-Code 923, Jan Gervin-Code 420). A poster session included 27 research posters, 5 with Goddard authors or co-authors. Half the workshop participants were from research universities. Also NASA representatives attended from Headquarters, the Ames Research Center, and the Jet Propulsion Laboratory. Other institutions represented included the US and Canadian Forest Services, the Smithsonian Institution, Woods Hole Research Center, Canada Center for Remote Sensing, the Joint Research Centre of the European Commission, and two private companies.

A special journal issue based on the workshop, with review papers and selected case studies, is in development. Workshop deliberations and findings will be made available for review and

comment on a web site at the University of Michigan. Workshop participants also expressed enthusiasm for follow-up activities and formation of an ongoing working group for terrestrial ecosystem structure and remote sensing. Suggested activities under the working group include analyses to further quantify and refine science and measurement requirements; helping design a field program for demonstration, assessment, intercomparison, calibration, and scientific use of remote sensing observations of structure; and work to raise the quality of dialog among scientists and engineers seeking to develop technology for global-scale structural measurements.